

# Ch. 7 Dummy / Binary Vars.

## Single binary/dummy var. (cont.)

$$y = \beta_0 + \beta_1 x_1 + \delta_0 x_2 + u$$

$$E(y | x_1, x_2) = \beta_0 + \beta_1 x_1 + \delta_0 x_2$$

$$\delta_0 = E(y | x_1, x_2=1) - E(y | x_1, x_2=0)$$

if  $y$ : wage  
 $x_1$ : educ.  
 $x_2$ : 1  $\rightarrow$  marr.  
           0  $\rightarrow$  not marr.  
 base/ref. group  
 effect of  $x_2=1$   
 rel. to  $x_2=0$   
 after controlling for  $x_1$

Note: 2 groups  $\rightarrow$  denoted by a single dummy

$x_3 \rightarrow$  1 not married  
           0 marr.

Not reqd.  $\therefore x_3$  &  $x_2 \rightarrow$  perfectly collinear

$x_2$	$x_3$
1	0
0	1

$\rightarrow$  dummy variable trap as long as  $\beta_0$  is present

N	S	E	W
1	0	0	0
0	1	0	0
0	0	1	0
0	0	0	1

If  $y$ : log(wage)

Approximate effect

of  $x_2=1$ :  $100 \hat{\delta}_0$  %

e.g.  $\hat{\delta}_0 = 0.26$

26%

## Multiple Categories

$$M \rightarrow 1 \text{ (marr.)}$$
$$\rightarrow 0 \text{ (not marr.)}$$

$$W \rightarrow 1 \text{ (Western region)}$$
$$\rightarrow 0 \text{ (not " )}$$

4 groups  $\Rightarrow$  choose one as base/ref.  
& include dummies for rest

$$y = \beta_0 + \beta_1 x_1 + \delta_0 x_2 + \delta_1 x_3 + \delta_2 x_4 + u$$

if  $y$ : wage

$x_1$ : educ.

$x_2$ :  $M=1$  &  $W=1 \rightarrow x_2=1$  & 0 o.w.

$x_3$ :  $M=1$  &  $W=0 \rightarrow x_3=1$  & 0 o.w.

$x_4$ :  $M=0$  &  $W=1 \rightarrow x_4=1$  & 0 o.w.

base/ref. group:  $M=0$  &  $W=0$

$\delta_0$ : effect of  $x_2=1$  rel. to base

$\delta_1$ : " "  $x_3=1$  "

$\delta_2$ : " "  $x_4=1$  "

e.g.  $\hat{\delta}_0 = 2.72$        $\hat{\delta}_1 = 1.3$        $\hat{\delta}_2 = 0.02$

Effect of  $M$  &  $W$  rel. to base = \$2.72  
"  $M$  & not  $W$  " = \$1.3